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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/816,770	03/26/2001	Tsuyoshi Kitahara	Q63724	4825

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EXAMINER

NGUYEN, LAM S

ART UNIT PAPER NUMBER

2853

DATE MAILED: 02/20/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/816,770

Applicant(s)

KITAHARA, TSUYOSHI

Examiner

LAM S NGUYEN

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 January 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-11 and 13-19 is/are rejected.
- 7) ☒ Claim(s) 12 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 March 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received. /
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Claim Objections

Claims 3 and 8 are objected to because of the following informalities: The word "form" in "selecting M drive signals form the N drive signals" should be rewritten as "from".

Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1-10, 13-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kitahara et al. (EP0827838) in view of Barbehenn et al. (U.S. 5363134) and Banno et al. (US 6060113).

Kitahara et al. disclose a method of jetting liquid droplets or a liquid jetting apparatus, comprising:

providing a liquid head (FIG. 1, element 10), including: a plurality of nozzle orifices (FIG. 3, element 22A, and column 6, line 19-22); a plurality of pressure generation chambers associated with the nozzle orifices (FIG. 3, element 27, and column 7, line 38-39); and a plurality of piezoelectric vibrators for respectively varying the volume of the associated pressure generation chamber to jet a liquid droplet from the associated nozzle orifice (FIG. 3, element 17);

Referring to claims 3, 6, 8:

comprising at least one drive signal generator (FIG. 1, element 8), for generating N drive signals (FIG. 9: Four selected signals), respectively driving the piezoelectric vibrators, within a single jetting cycle (FIG. 9: in term of "print period") (FIG. 4) of the liquid jetting head, N being an integer which is not less than 3 (FIG. 9: $N = 4$);

comprising a drive signal supplier (FIG. 1, element 16) for selecting at least one drive signals or M drive signals (FIG. 9: $M =$ one or at least two) from the plural or N drive signals to adjust a displacement behavior of a piezoelectric vibrator associated with the identified nozzle orifice (FIG. 9: each selected signal adjusts the amount of ink ejected), wherein M being an integer which is equal to or less than N (FIG. 9, $M = 1$ or $2 < N = 4$);

applying the M drive signals to the piezoelectric vibrators within the single jetting cycle (FIG. 9);

Referring to claim 2: providing a plurality of drive signals for driving the piezoelectric vibrators to jet liquid droplets from the nozzle orifices, the drive signals respectively having different liquid jetting energy from each other; selecting at least one drive signal within a single jetting cycle of the jetting head; and applying the selected drive signal to the piezoelectric vibrators (FIG. 9).

Referring to claims 4, 9: wherein the selected drive signals are applied at different intervals within the single jetting cycle (FIG. 9)

Referring to claims 5, 10: wherein the intervals are determined such that a phase of residual vibration of a meniscus of the liquid in the nozzle orifice is adjusted due to jetting by a preceding drive signal (FIG. 4-7, and column 10, line 20-35).

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Referring to claim 7: wherein the drive signal supplier selects at least two drive signals from the plural drive signals (FIG. 9).

Kitahara et al. do not disclose the providing ID data provides the ID data for identifying the respective nozzle orifices.

However, Barbehenn et al. disclose ID data storage provides the ID data for identifying the respective nozzle orifices (column 3, line 43-53).

Therefore, it would have been obvious for one having ordinary skill in the art at the time the invention was made to include the ID storage (column 3, line 43-53) for providing the ID data of the respective nozzle orifices as disclosed by Barbehenn et al. into the printing apparatus disclosed by Kitahara et al. The motivation of doing so is to increase the capability of controlling the ejecting of proper ink volume, the ink drop velocity, and various other manufacturing tolerances or defects for driving an array of nozzle orifices as taught by Barbehenn et al. (column 2, line 2-8).

In addition, Kitahara et al. and Barbehenn et al. do not disclose the providing a reference drive signal which is applied to the piezoelectric vibrator such that a reference liquid droplet having a designated amount is jetted from the nozzle orifice; applying the reference drive signal to the respective piezoelectric vibrators to jet liquid droplet from the nozzle orifices; measuring amounts of the respective liquid droplets jetted by the reference drive signal; identifying a difference between the designated amount and the measured amount of each liquid droplet; providing correction data for reducing the difference; and adjusting a displacement behavior of a piezoelectric vibrator associated with the identified nozzle orifice, based on the corrected data

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drive signal when the identified nozzle orifice receives print data (FIG. 4-7, and column 10, line 20-35) (**Referring to claims 13-19**).

However, Banno et al. (US 6060113) disclose a process used in an image forming apparatus wherein the process comprising of the providing a reference drive signal which is applied to an piezoelectric vibrator (column 29, line 25) such that a reference liquid droplet having a designated amount is jetted from the corresponding nozzle orifice; applying the reference drive signal to the respective piezoelectric vibrators to jet liquid droplet from the nozzle orifices; measuring amounts of the respective liquid droplets jetted by the reference drive signal (column 29, line 47-56); identifying a difference between the designated amount and the measured amount of each liquid droplet (column 29, line 56-57); providing correction data for reducing the difference (column 29, line 60- column 30, line 11); and adjusting a displacement behavior of a piezoelectric vibrator associated with the identified nozzle orifice, based on the corrected data (column 30, line 12-16).

Therefore, it would have been obvious for one having ordinary skill in the art at the time the invention was made to include the providing a reference drive signal to the actuator to jet a designated amount of liquid, measuring amounts of the jetted liquid droplets, identifying a difference between the designated amount and the measured amount of each liquid droplet, providing correction data for reducing the difference, and adjusting a displacement behavior of the piezoelectric vibrator based on the corrected data as disclosed by Banno et al. into the process used in the jetting liquid droplets apparatus disclosed by Kitahara et al. in view of Barbehenn et al. The motivation of doing so is to detect information associated with a droplet and to control the ejecting operation based on the detected information in order to control the

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amount of a droplet to a desired value as taught by Banno et al. (column 29, line 29-30 and line 36-39).

2. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kitahara et al. (EP0827838) in view of Barbehenn et al. (U.S. 5363134) and Banno et al. (US 6060113) as regarded to claim 8, and further in view of Bain (U.S. 4521786).

Kitahara et al., Banno et al., and Barbehenn et al. disclose the claimed invention as discussed above, except wherein a plurality of drive signal generators are provided such that different drive signals are generated from the respective drive signal generator.

However, Bain discloses a printing system including a plurality of drive signal generators (in term of "programmable driver/control (PDC)") (FIG. 4 and FIG. 5, element 113) are provided such that different drive signals are generated from the respective drive signal generator.

Therefore, it would have been obvious for one having ordinary skill in the art at the time the invention was made to replace the drive signal generator in the liquid ejecting apparatus disclosed by Kitahara et al. in view of Barbehenn et al. and Banno et al. by the plurality of drive signal generator for providing different drive signals as disclosed by Bain. The motivation of doing so is to be able to separately program the parameters such as velocity and volume of a droplet at each drive signal generator for each different nozzle orifice in order to obtain optimal operation of the printhead as taught by Bain (column 1, line 46-61).

Allowable Subject Matter

3. Claim 12 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

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The most pertinent arts Kitahara et al. (EP0827838), Barbehenn et al. (U.S. 5363134), and Banno et al. (US 6060113) fail to disclose wherein volume differences among the liquid droplets ejected by the respective drive signals can be divided by a volume of a liquid droplet which is the minimum volume jetted by one single drive signal. Therefore, the claimed invention is not disclosed by the cited prior arts.

Conclusion

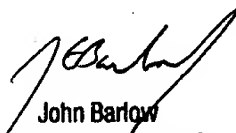
Any inquiry concerning this communication or earlier communications from the examiner should be directed to LAM S NGUYEN whose telephone number is (703)305-3342. The examiner can normally be reached on 7:00AM - 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, JOHN E BARLOW can be reached on (703)308-3126. The fax phone numbers for the organization where this application or proceeding is assigned are (703)305-3431 for regular communications and (703)305-3432 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

LN

February 10, 2003


John Barlow
Supervisory Patent Examiner
Technology Center 2800